

# "ENVIRONMENTAL AND ADMINISTRATIVE ENVIRONMENT FOR AUTONOMOUS ENERGY SUPPLY IN THE TOMSK REGION"

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# Solar radiation in Tomsk region



## Spain



4.7 kWatt/h.  
(m<sup>2</sup> per day).

## Germany



3.3 kWatt/h.  
(m<sup>2</sup> per day).

## Russia

Irkutsk region, Primorskiy kray,  
Krasnodar region

Tomsk region  
3.3 – 3.7 kWatt/h. (m<sup>2</sup> per day).

Sunshine, hours per month													
month	Jun	Feb	March	Apr	May	June	Jule	Aug	Sep	Okt	Nov	Dec	Year
Sunshine, hours	56	105	171	225	257	315	316	254	171	87	51	40	2048

On average, the sun shines in Tomsk 1733 hours (40% of the possible). The number of days with no sun for the year - 92

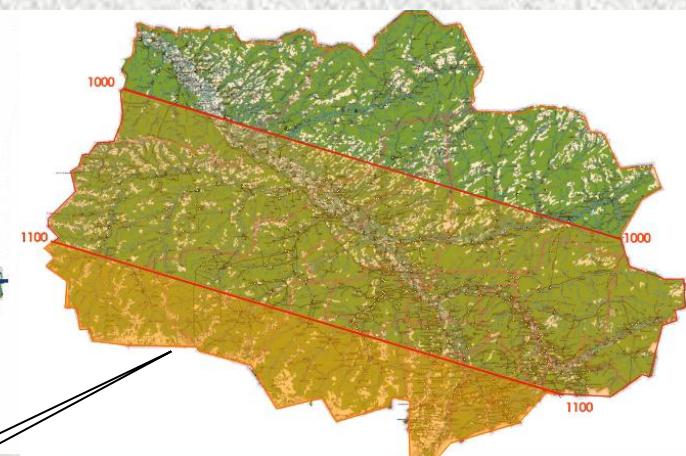
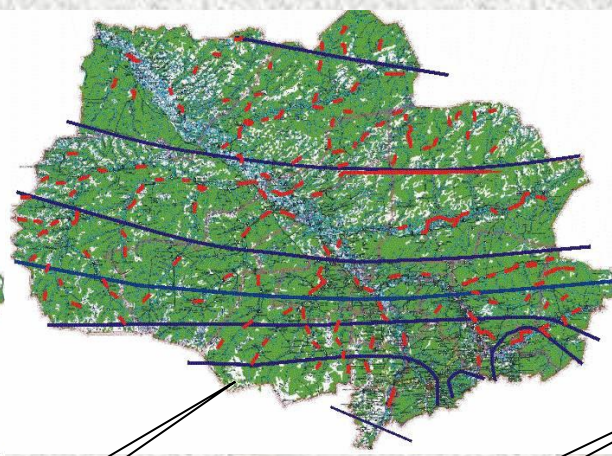
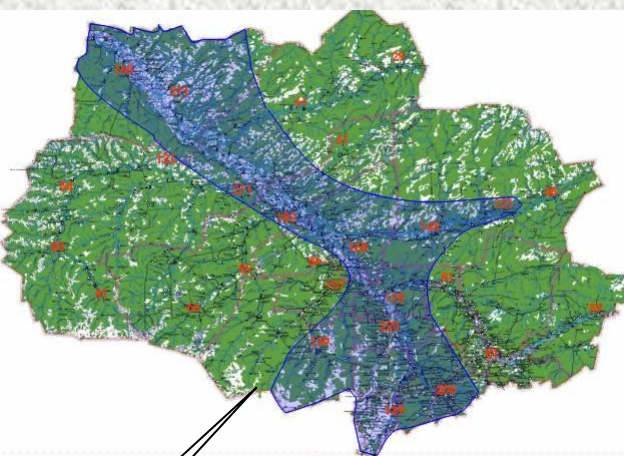


# Climatic condition in Tomsk region



	Jun.	Feb.	March	Apl.	May	June	July	Aug.	Sep.	Okt.	Nov.	Dec.	Year
The absolute maximum, °C	3,7	7,1	17,7	26,5	34,4	34,7	35,1	33,8	31,7	25,1	11,6	6,5	35,1
Average maximum, °C	-13	-9,6	-1,1	7,0	17,5	22,3	24,8	21,7	14,4	6,0	-4,8	-11,1	6,2
The average temperature, °C	-17,1	-14,7	-7	1,3	10,4	15,8	18,7	15,7	9,0	1,7	-8,3	-15,1	0,9
Average minimum, °C	-20,9	-18,9	-11,9	-3,3	4,7	10,5	13,7	11,1	5,1	-1,3	-11,4	-18,9	-3,5
The absolute minimum, °C	-55	-51,3	-42,4	-31,1	-17,5	-3,5	1,5	-1,6	-8,1	-29,1	-48,3	-50	-55
Rainfall in mm	35	24	25	34	41	61	75	67	50	55	52	49	568

## The cadastre of the renewable energy sources of Tomsk region



1

2

3

- 1 – wind
- 2 – hydro-energetic
- 3 – solar radiation



# Tomsk region



**Energy consumption of Tomsk region**

**More 6 million eq.tonn of fuel**

**Export 40% of electricity  
100% of diesel fuel**



**Diesel station: 123**

**Total price of fuel**

**about 20 million \$/year**

**Cost of the electricity in 81 settlements  
is 0.5 - 2.5 \$ per 1 kW/h**

**Currently, more than 20 million people in Russia  
live in similar conditions.**





## National Research Tomsk Polytechnic University.



[www.tpu.ru](http://www.tpu.ru) 30 Lenina st. Tomsk, Russia 634050

- PV modules and tracking the sun.
- Wind energy
- Hydrogen Energy
- Creation on the basis of their combined power





## 5 KWatt Solar-wind power systems



### **The station consists of:**

- solar generator ARPS-250 (10 elements),
- wind generator 1000 W (2 elements),
- voltage transducer =48/~220V, 50 Hz,
- control system.

### **Specification:**

- generator capacity is no more than 5000 W,
- output voltage ~ 220 V, 50 Hz (sine),
- surface area of the PV modules is no more than 230 m<sup>2</sup>,
- effective area of the station is no more than 300 m<sup>2</sup>,
- height of the wind generator tower is 6 m,

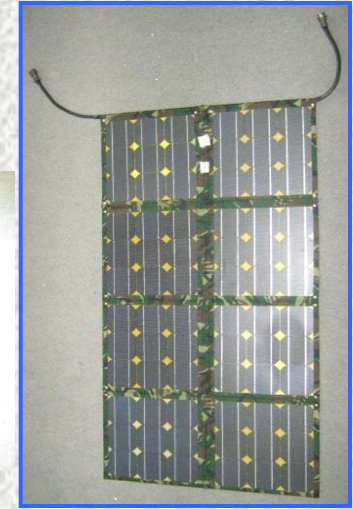


# JSC Scientific-Research Institute of Semiconductor Devices



[www.niipp.ru](http://www.niipp.ru) 99a Krasnoarmeyskay st.  
Tomsk, Russia 634050

➤ PV modules



➤ PV systems



➤ Wind-solar power systems 8



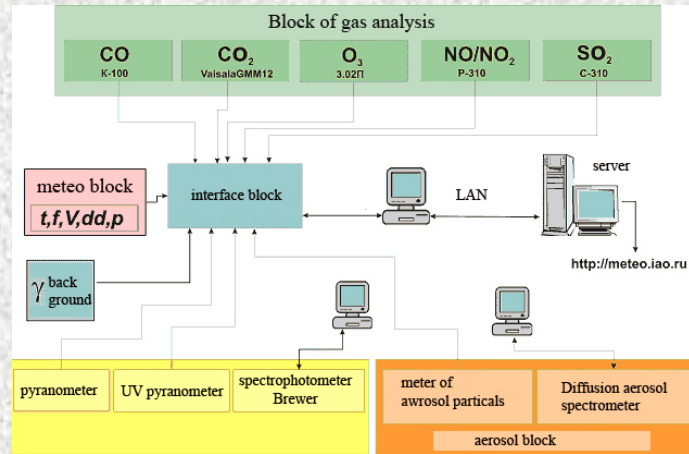


# V.E. Zuev Institute of atmospheric optics Russian academy of sciences, Siberian branch

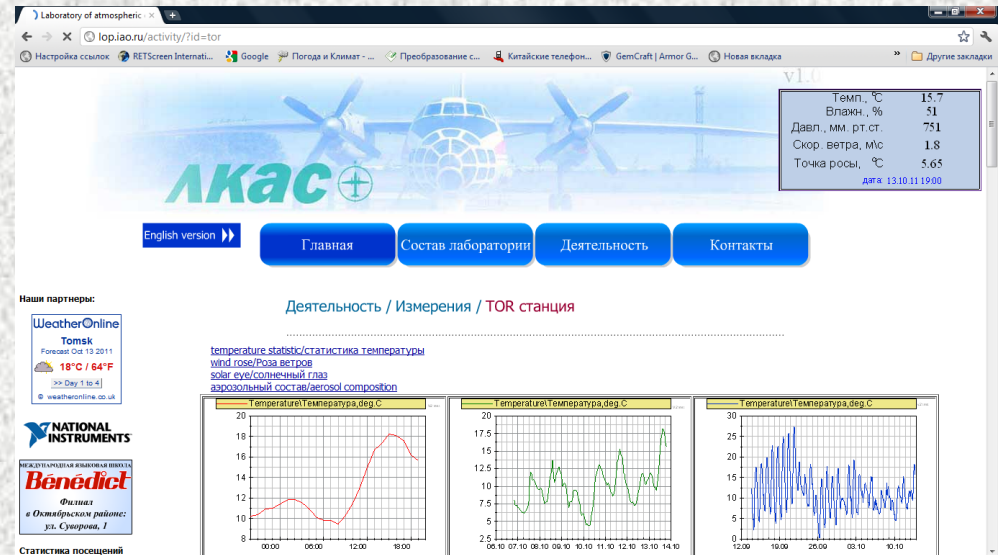


[www.iao.ru](http://www.iao.ru)

12 Akademicheskoy Avenue  
Tomsk, Russia 634055



**TOR-station  
for atmosphere  
parameters control  
(38 parameters)  
[meteo.iao.ru](http://meteo.iao.ru)**





# Place of project implementation 1

- Climatic (nature) test
- Forecasting systems
- Collection weather data
- Development intellectual lighting system (perimeter of building)





## Place of project implementation 2

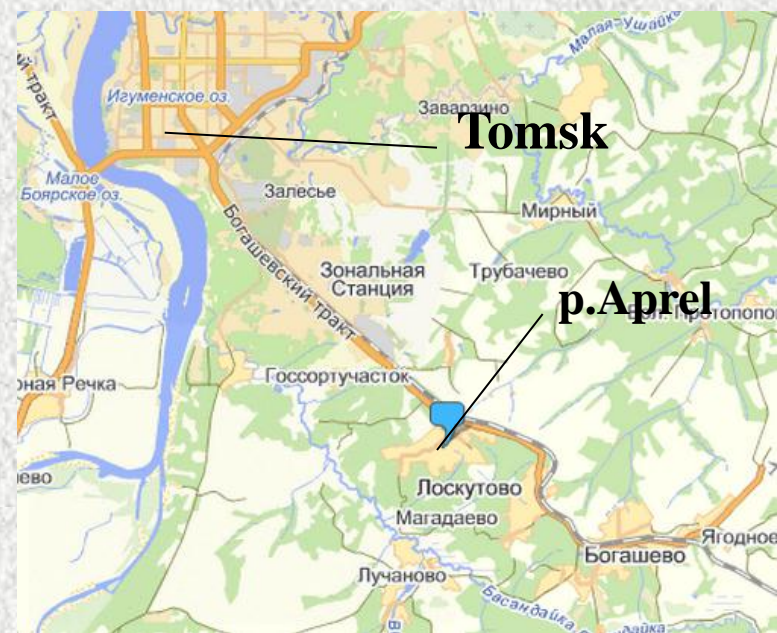
**Establishing a pilot power supply system  
+ LED lighting in small settlements  
with processing and agro-cultural production.**

Possible variants:

**1. Suburban villages (p. April and etc.)**

in the area of 10-15 km. from the city.

Village has all the communications (electricity, water, roads), individual houses and small production (bakery, fish shop, etc.)



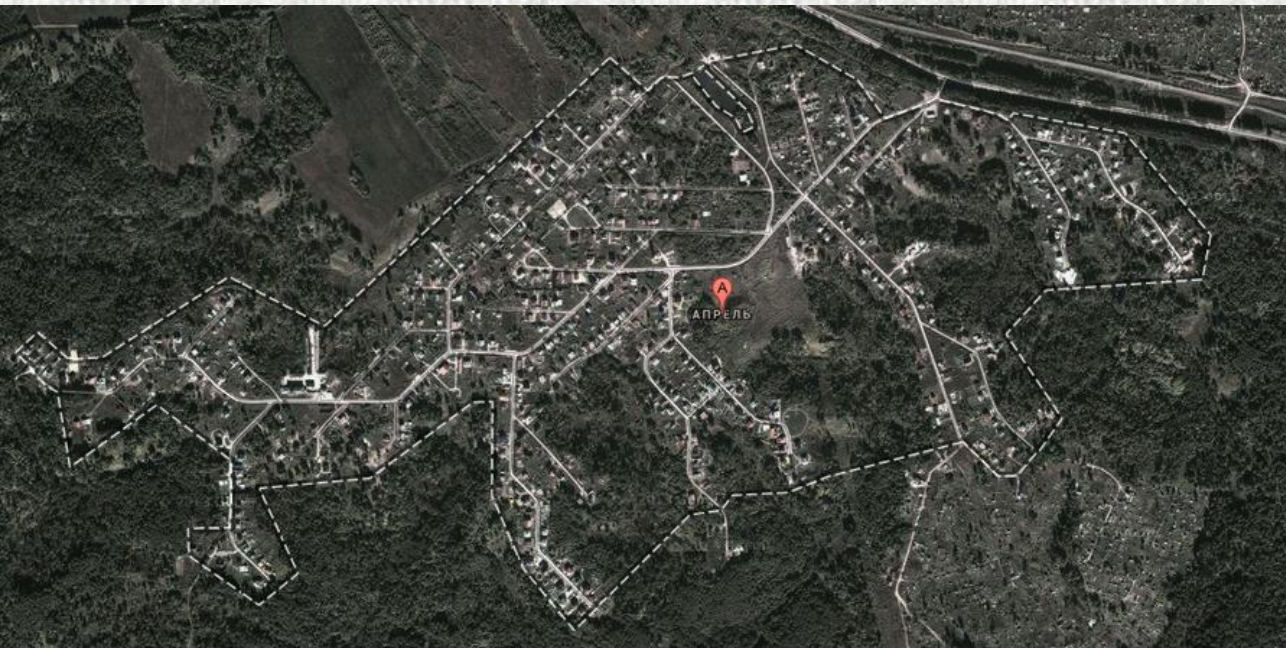
**2. Villages with all utilities and access roads**

(Kozhevnikovo, Kolpashego 50-100 km from Tomsk).

Agro-cultural production (dairy farms, small bird farms, processing wild plants)



# Place of project implementation 2



## Map of April village

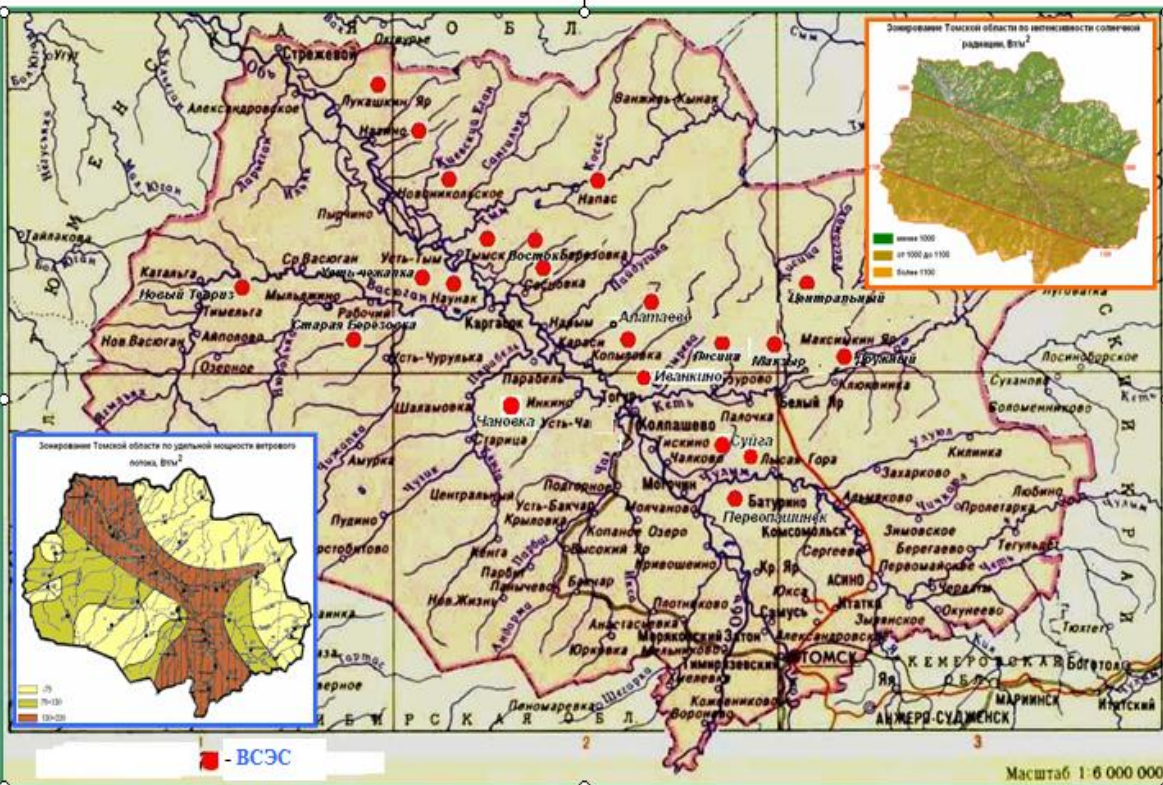




# Place of project implementation 3

## Implementation phase of the autonomous power supply system and lighting for remote villages. Replacement of diesel power plant.

РАСПРЕДЕЛЕНИЕ ВЕТРОВОЙ И СОЛНЕЧНОЙ ЭНЕРГИИ ПО РАЙОНАМ ТОМСКОЙ ОБЛАСТИ И ПЕРСПЕКТИВНЫЙ ПЛАН РАЗМЕЩЕНИЯ ВЕТРО-СОЛНЕЧНЫХ ЭЛЕКТРОСТАНЦИЙ НА ТЕРРИТОРИИ ОБЛАСТИ





National Research  
Tomsk Polytechnic University



*Scientific-Research  
Institute of  
Semiconductor Devices*



*Institute of atmospheric  
optics Russian academy  
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# Thank you for attention

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